

# Per- and Polyfluoroalkyl Substances (PFAS) Summary Report

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## 1. Introduction

Per- and polyfluoroalkyl substances (PFAS) are a group of manmade chemicals that includes perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), GenX, and many other chemicals. PFAS have been manufactured and used in a variety of industries around the globe, including in the United States since the 1940s. PFAS are found in a wide range of consumer products that people use daily such as cookware, pizza boxes, and stain repellants (U.S. Environmental Protection Agency (EPA) 2018b).

Most people have been exposed to PFAS. Certain PFAS, such as PFOA and PFOS, can accumulate and stay in the human body for long periods of time. There is evidence that exposure to PFAS can lead to adverse health outcomes in humans. PFOA and PFOS have been the most extensively produced and studied of these chemicals. Studies indicate that PFOA and PFOS can cause reproductive and developmental, liver and kidney, and immunological effects in laboratory animals. Both chemical groups have caused tumors in animals. The most consistent findings are increased cholesterol levels among exposed populations, with more limited findings related to

- low infant birth weights,
- effects on the immune system,
- cancer (for PFOA), and
- thyroid hormone disruption (for PFOS; EPA 2018b).

The purpose of this summary report is to provide information on all PFAS<sup>1</sup> in the Toxic Substances Control Act (TSCA) Chemicals Substances Inventory (hereafter referred to as the Inventory), rather than only on a subset such as PFOA or long-chain perfluoroalkyl carboxylic acids (PFCAs). Section 1 provides a definition of PFAS and describes how PFAS are classified in this report. Section 2 provides a brief overview of regulatory actions impacting PFAS manufacture and use. Section 3 describes PFAS manufacturing and import, and Section 4 presents an overview of PFAS uses and applications.

### 1.1 PFAS Definition and Classification

PFAS refer to a sub-group of per- and polyfluorinated chemicals (PFCs).<sup>2,3</sup> PFCs are organic compounds with fluorine replacing some or all of the chemical's hydrogen (OECD 2018b). Though EPA has historically used the term PFC to refer to fluorinated compounds more generally, the accepted terminology within the Agency has shifted to PFAS. The term includes chemicals such as PFOA and PFOS. EPA previously used the PFAS abbreviation for perfluoroalkyl sulfonic acid, which now is abbreviated as PFSA. For the purpose of this summary report, the term PFAS is used to describe the broader categories of chemicals.

Thousands of PFAS have been produced and used globally. The Organization for Economic Co-operation and Development (OECD) classifies the chemicals as shown in Figure 1-1.<sup>4</sup> The Figure presents commonly recognized categories of PFAS in OECD's Global Database. The classification is

<sup>1</sup> PFAS include per- and polyfluorinated substances of C2 and greater for the purpose of this report (and the underlying TSCA data utilized in it).

<sup>2</sup> PFCs has also been used to abbreviate a related group of fluorinated chemicals called perfluorocarbons.

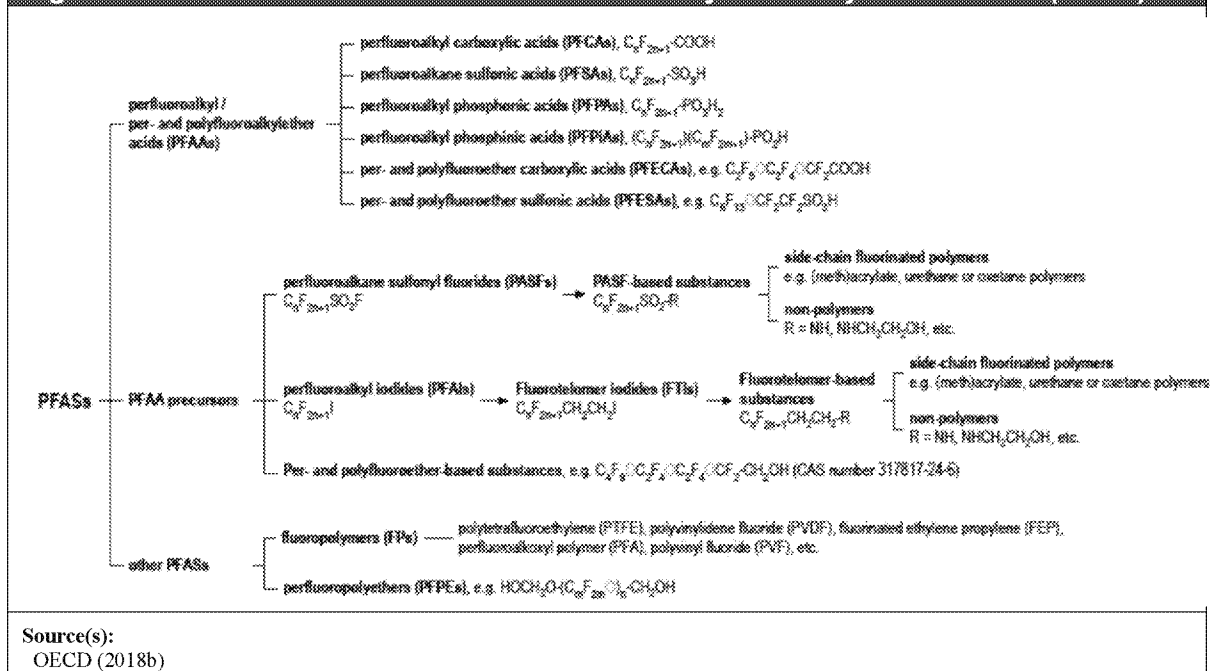
<sup>3</sup> See <https://www.epa.gov/pfas/what-are-pfcs-and-how-do-they-relate-and-polyfluoroalkyl-substances-pfas>

<sup>4</sup> The structural parameters that constitute PFAS can differ between countries and organizations.

being adopted in this market report to help facilitate the discussion. PFAS are broken into three major categories

1. perfluoroalkyl/per- and polyfluoroalkylether acids (PFAAs),
2. PFAA precursors,
3. and other PFAS.

**Figure 1-1: General Classification of Per- and Polyfluoroalkyl Substances (PFAS)**



Historically, EPA was interested in two broad categories of PFAS within the PFAA group, long-chain perfluoroalkyl sulfonic acids (PFSAs), which include PFOS, and long-chain perfluoroalkyl carboxylic acids (PFCAs), which include PFOA. The focus of this report has expanded this traditional focus to include all PFAS, both short- and long-chain.

PFSAs and PFCAs are classified as either long-chain or short-chain depending on the number of perfluoroalkyl carbons or the number of total carbons. Definitions for long-chain versus short-chain PFAS vary. For example, long-chain PFSAs have been defined as chemicals with 6 or more perfluoroalkyl carbons (or 6 or more total carbons). Long-chain PFCAs have been defined as chemicals with 7 or more perfluoroalkyl carbons (or 8 or more total carbons). OECD only defines long-chain for PFSAs and PFCAs. However, Buck et al. (2011) considers other PFAS with 7 or more perfluoroalkyl carbons as long-chain. For the purposes of TSCA, definitions of short and long chain have also varied, particularly between PFAS sub-categories, for example, in the Significant New Use Rule (SNUR) amendment for long-chain perfluoroalkyl carboxylate (LCPFAC). For simplicity and illustration in this summary report, short-chain PFAS are defined as ( $< 7 CF_2$ ) and long chain as ( $\geq 7 CF_2$ ).

The first step in identifying chemicals within the PFAS universe was to search the Inventory for the presence of these chemicals. This was done by searching for the term poly- and perfluoro (with 2 or

greater carbons) in the chemicals names listed on the Inventory. The list of Chemical Abstracts Services (CAS) registry numbers that fit this description was provided by the Industrial Chemistry Branch (ICB) of the Environmental Protection Agency (EPA) and includes 1,220 PFAS. Of the 1,220 PFAS, 824 are non-CBI and 396 are CBI (see Table 1-1).

<b>Table 1-1: Summary of PFAS in the Inventory</b>	
<b>Parameter</b>	<b>Number of Chemicals</b>
Total Number of PFAS	1,220
Non-CBI PFAS	824
CBI-PFAS	396

Table 1-2 presents the commercial status designation of the 1,220 PFAS chemicals on the Inventory. A total of 551 chemicals are of known active status. Active status indicates that the chemical was commercially active during the 10 years prior to June 22<sup>nd</sup> 2016 when TSCA was reauthorized. Chemical processors are still reporting to EPA regarding the chemicals they manufacture and import. The reporting period for processors closes on October 5, 2018, after which, all Inventory substances will be classified with either an active or inactive designation.

<b>Table 1-2: Commercial Status Designation of PFAS in the Inventory</b>		
<b>TSCA Chemicals</b>	<b>Total</b>	<b>Active</b>
Non-CBI PFAS	824	322
CBI PFAS	396	229
<b>Total</b>	<b>1,220</b>	<b>551</b>

Table 1-3 presents the TSCA Inventory PFAS list according to eight major PFAS subcategories that are derived from the hierarchy provided in Figure 1-1. Chemical categories were applied by searching the OECD global database by the CAS number, and assigning the corresponding PFAS category to each chemical. The perfluoroalkane sulfonyl compounds (e.g., PFSA) group comprised the largest number of PFAS with a total of 310 (68 active). This was followed by the fluorotelomer-related compounds (e.g. FTIs) group, which comprises a total of 212 PFAS (97 active). Table A-1 presents a more detailed description of the PFAS subcategories and respective chemical groups within each subcategory.

<b>Table 1-3: Non-CBI TSCA Inventory PFAS by PFAS Category</b>		
<b>PFAS Category</b>	<b>Total</b>	<b>Active</b>
perfluoroalkyl carbonyl compounds (e.g., PFCA)	78	22
perfluoroalkane sulfonyl compounds (e.g., PFSA)	310	68
perfluoroalkyl phosphate compounds (e.g., PFPA)	2	2
fluorotelomer-related compounds (e.g., FTI)	212	97
per- and polyfluoroalkyl ether-based compounds (e.g. PFEECA)	58	31
other PFAA precursors and related compounds - perfluoroalkyl ones	38	22
other PFAA precursors or related compounds – semi fluorinated (e.g., HFE)	15	13
fluoropolymers (e.g., PTFE)	54	40
Not Classified	57	27
<b>Total</b>	<b>824</b>	<b>322</b>

For the remainder of this report, only Active substances will be discussed. The next step was to determine the number of short- and long-chain PFAS. In this report, perfluoroalkyl carbon chain length thresholds for short- and long-chain PFAS are defined as less than 7 CF<sub>2</sub> for short-chain and greater than or equal to 7 CF<sub>2</sub> for long-chain. These definitions are based on Buck et al. (2011). Table 1-4 presents the number of active short-chain and long-chain PFAS. The chain lengths were extracted from the OECD global database. It is important to note that not all of the 322 Active Inventory chemicals could be categorized in the OECD database and the data presented in Table 1-4 reflect this limitation. A total of 254 PFAS (of the 322) could be classified as short- or long-chain, these are presented in Table 1-4.<sup>5</sup> A total of 68 PFAS were excluded from the table, 27 because they were not in the OECD global database and 41 because they have multiple perfluoroalkyl carbon chain lengths reported or have unclear chemical descriptions.<sup>6,7</sup> Of the 254 active PFAS summarized in Table 1-4, 111 are short-chain and 143 are long-chain PFAS.

Table 1-4: Perfluoroalkyl Carbon Chain Length of Active PFAS in the Inventory			
PFAS Category	Total	Perfluoroalkyl Carbon Chain Length <sup>1,2</sup>	
		Short-chain (< 7 CF <sub>2</sub> )	Long-chain (≥ 7 CF <sub>2</sub> )
perfluoroalkyl carbonyl compounds (e.g., PFCA)	21	14	7
perfluoroalkane sulfonyl compounds (e.g., PFSA)	64	37	27
perfluoroalkyl phosphate compounds (e.g., PFPA)	0	0	0
fluorotelomer-related compounds (e.g., FTI)	65	27	38
per- and polyfluoroalkyl ether-based compounds (e.g. PFECA)	31	10	21
other PFAA precursors and related compounds - perfluoroalkyl ones	21	14	7
other PFAA precursors or related compounds – semi fluorinated (e.g., HFE)	12	9	3
fluoropolymers (e.g., PTFE)	40	0	40
<b>Total</b>	<b>254</b>	<b>111</b>	<b>143</b>
<b>Note(s):</b> <sup>1</sup> Only PFAS in the OECD global database are categorized by perfluoroalkyl carbon chain length. Of the 322 Active PFAS, the 254 Active PFAS are summarized in this table. A total of 68 Active PFAS are excluded from the table, 27 because they were not in the OECD global database and 41 because they have variable or unclear perfluoroalkyl carbon chain lengths. <sup>2</sup> Perfluoroalkyl carbon chain length thresholds presented in this table (short-chain, < 7; long-chain, CF <sub>2</sub> ≥ 7 CF <sub>2</sub> ) are guideline thresholds appearing in Buck et al. (2011). Only PFSAs and PFCAs have thresholds defined by OECD. According to OECD, long-chain PFSAs refer to PFSAs with 6 or more perfluoroalkyl carbons and long-chain PFCAs refer to PFCAs with 7 or more perfluoroalkyl carbons.			

Table 1-5 presents the number of PFAS reported in the Chemical Data Reporting (CDR) database from 2006 to 2016. The total number of PFAS (824) in the Inventory were cross-referenced with all of the chemicals reported in the 2006, 2012, and 2016 CDR by CAS number. A total of 161 were reported in 2016, of which 90 were listed as non-CBI PFAS. Note that three chemicals reported in the 2006 CDR are not active in the current Inventory. The largest category was FTI chemicals with 38 non-CBI reported in 2016.

<sup>5</sup> According to OECD, long chain PFSAs refer to PFSAs with 6 or more perfluoroalkyl carbons and long chain PFCAs refer to PFCAs with 7 or more perfluoroalkyl carbons.

<sup>6</sup> Many of the chemicals that have multiple chain lengths reported have unspecified or partially unspecified chemical formulas (OECD 2018a). For chemicals that have specified chemical formulas, it is unclear why each has multiple chain lengths reported.

<sup>7</sup> Unclear descriptions include chemicals described with ambiguous descriptions such as “reaction products”, described with unclear terms, or registered with only trade names and general descriptions (OECD2018b).

<b>Table 1-5: Number of PFAS Reported in the CDR</b>			
<b>PFAS Category</b>	<b>2006 CDR</b>	<b>2012 CDR</b>	<b>2016 CDR</b>
<b>Non CBI</b>			
perfluoroalkyl carbonyl compounds (e.g., PFCA)	4	4	4
perfluoroalkane sulfonyl compounds (e.g., PFSA)	3	5	8
perfluoroalkyl phosphate compounds (e.g., PFPA)	0	0	2
fluorotelomer-related compounds (e.g., FTI)	27	28	38
per- and polyfluoroalkyl ether-based compounds (e.g. PFEECA)	8	13	12
other PFAA precursors and related compounds - perfluoroalkyl ones	5	4	8
other PFAA precursors or related compounds – semi fluorinated (e.g., HFE)	5	8	9
fluoropolymers (e.g., PTFE)	0	0	1
Not Classified	10	8	8
<b>Total</b>	<b>62</b>	<b>70</b>	<b>90</b>
<b>CBI</b>			
<b>Total</b>		<b>29</b>	<b>71</b>
<b>Non-CBI and CBI</b>			
<b>Total</b>		<b>99</b>	<b>161</b>

## 2. Regulatory Background

EPA has undertaken several key regulatory actions to address PFAS. Table 2-1 provides a chronological overview of some of these major efforts. In particular, EPA has published significant new use rules (SNURs) for PFAS, beginning in 2002, that require manufacturers to notify EPA at least 90 days before manufacturing, importing, or processing PFAS. Table 2-2 provides more details about those SNURs.



**Table 2-1: EPA Actions to on PFAS**

Title	EPA Office	Date	Summary
New Chemicals Program Review of Alternatives for PFOA and Related Chemicals	OPPT	Ongoing	EPA reviewed hundreds of new chemical substitutes for PFOA, PFOS, and other long-chain PFAS under EPA's New Chemicals Program since 2000. EPA reviews the new substances to identify whether the range of toxicity, fate and bioaccumulation issues that have caused past concerns with perfluorinated substances may be present, as well as any issues that may arise by new chemistries, to ensure that the new chemical may not present an unreasonable risk to health or the environment. One outcome of EPA's review of a PMN or MCAN for a new chemical substance or review of a SNUN for a significant new use is the issuance of an order under section 5(e) of TSCA. Most TSCA section 5(e) Orders issued by EPA are Consent Orders that are negotiated with the submitter of the notification.
Lifetime Health Advisories and Health Effects Support Documents for PFOA and PFOS	OW	May 16 <sup>th</sup> 2016	EPA announced the release of lifetime health advisories (HAs) and health effects support documents for PFOA and PFOS. EPA's HAs, which identify the concentration of PFOA and PFOS in drinking water at or below which adverse health effects are not anticipated to occur over a lifetime of exposure, are: 70 parts per trillion (ppt) for PFOA and PFOS.
Significant New Use Rules (SNURs): Long-Chain Perfluoroalkyl Carboxylate and Perfluoroalkyl Sulfonate Chemical Substances Proposed Rule	OPPT	January 21 <sup>st</sup> 2015	EPA proposed a SNUR for Long-Chain Perfluoroalkyl Carboxylate (LCPFAC) chemical substances that would require manufacturers (including importers) of PFOA and PFOA-related chemicals, including as part of articles, and processors of these chemicals to notify EPA at least 90 days before starting or resuming new uses of these chemicals in any products.
Significant New Use Rules: Perfluoroalkyl Sulfonates and Long-Chain Perfluoroalkyl Carboxylate Chemical Substances (Final)	OPPT	October 22 <sup>nd</sup> 2013	EPA amended a SNUR to designate as a significant new use PFAS that have completed the new chemical review process under TSCA but have not yet commenced production or import and processing. EPA also finalized a SNUR to designate as a significant new use LCPFAC chemical substances used in manufacturing (including importing) and processing of carpets or for treating carpet.
Revisions to the Unregulated Contaminant Monitoring Rule for Public Water Systems	OW	May 2 <sup>nd</sup> 2012	The UCMR3 required monitoring for 30 contaminants (28 chemicals and two viruses) between 2013 and 2015 using analytical methods developed by EPA, consensus organizations, or both. The purpose of UCMR3 was to collect occurrence data for contaminants suspected to be present in drinking water, but that do not have health-based standards set under the SDWA. Six perfluorinated compounds were included in the UCMR3: PFOS, PFOA, PFNA, PFHxS, PFBS, and perfluoroheptanoic acid (PFHpA). Of these 6 compounds, PFOA and PFOS were found in the greatest number of samples. However, less than one percent of the public water systems sampled had results that exceeded the reference dose (lifetime HA limit of 70 ppt or 0.07µg/L).
Premanufacture Notification Exemption for Polymers; Amendment of Polymer Exemption Rule to Exclude Certain Perfluorinated Polymers	OPPT	January 27 <sup>th</sup> 2010	EPA published a final rule that amended the Polymer Exemption Rule to no longer exclude from eligibility polymers that include any one or more of the following: PFAS, PFAC, or perfluoroalkyl moieties that are covalently bound to either a carbon or sulfur atom where the carbon or sulfur atom is an integral part of the polymer molecule. Compliance date was January 27, 2012.

Table 2-1: EPA Actions to on PFAS			
Title	EPA Office	Date	Summary
Provisional Health Advisories for PFOA and PFOS	OW	January 8 <sup>th</sup> 2009	EPA conducted limited testing of agricultural sites in Alabama where sewage sludge was applied from a local wastewater treatment plant that receives wastewater from numerous industrial sources, including facilities that manufacture and use PFOA and other PFAS. The results of this limited testing showed elevated levels of PFAS in sludge and in soil that received the sludge.
Significant New Use Rule: Perfluoroalkyl Sulfonates	OPPT	October 9 <sup>th</sup> 2007	EPA finalized a SNUR on 183 PFAS chemicals believed to be no longer manufactured, imported, or used in the U.S. The SNUR required manufacturers and importers to notify EPA at least 90 days before commencing the manufacture or import of the PFAS chemicals for the significant new uses described.
Significant New Use Rule: Perfluoroalkyl Sulfonates	OPPT	December 9 <sup>th</sup> , 2002 (Origination Date)	EPA issued a SNUR for 75 PFAS, requiring manufacturers and importers to notify EPA at least 90 days before starting the manufacture or importation of these chemical substances for the significant new uses described.
Significant New Use Rule; Final Rule and Supplemental Proposed Rule: Perfluoroalkyl Sulfonates	OPPT	March 11 <sup>th</sup> 2002 (Origination Date)	EPA published a SNUR to require notification to EPA before any future manufacture (including import) of 13 PFAS chemicals specifically included in the voluntary phaseout of PFOS by 3M that took place between 2000 and 2002.
<b>Source(s):</b> EPA (2018a)			

Significant New Use Rules (SNURs) have restricted the manufacture, import, and use of many PFAS. Table 2-2 presents the Significant New Use Rules (SNURs) for existing PFAS. The first SNUR was proposed in 2000 covering 90 long-chain PFASs, more specifically, long-chain PFOSs. From 2002 to 2007, EPA identified a total of 270 PFASs. In 2010, EPA amended the Polymer Exemption Rule to exclude from eligibility polymers containing as an integral part of their composition, except as impurities, certain perfluoroalkyl moieties consisting of a CF<sub>3</sub>- or longer chain length. Beginning in 2013, EPA shifted attention to long-chain PFCAs to limit uses in carpets and carpet treatment products.

**Table 2-2: Significant New Use Rules for Existing PFAS**

October 18, 2000 - Proposed SNUR on 90 perfluorooctyl sulfonyl (PFOS) long-chain chemicals (65 FR 62319)
March 11, 2002 - Final SNUR on 13 perfluoroalkyl sulfonate (PFAS) chemicals (67 FR 11008)
March 11, 2002 - Proposed SNUR on 74 PFAS chemicals, including PFOS (67 FR 11014)
December 9, 2002 - Final SNUR on 74 PFAS/PFOS chemicals (67 FR 72854)
October 9, 2007 - Final SNUR on 183 PFAS chemicals believed to no longer be manufactured (including imported) or used in the United States (72 FR 57222)
January 27, 2010 - Polymer Exemption Rule revoking exemption from full PMN reporting for new PFC polymers (75 FR 4295)
October 22, 2013 - Proposed SNUR amendment at 40 CFR 721.10536 for LCPFAC chemical substances by designating manufacturing (including importing) or processing of LCPFAC chemical substances listed in Table 1 of the Rule for any use that is no longer ongoing after December 31, 2015, as a significant new use; designating manufacturing (including importing) or processing of PFOA or its salts for any use as a significant new use; and designating manufacturing (including importing) or processing of all other LCPFAC chemical substances for any use not ongoing as of the date on which this proposed rule is published as a significant new use.
January 21, 2015 - Proposed SNUR on LCPFAC chemical substances to ensure that perfluorinated chemicals that have been phased out do not re-enter the marketplace without review (80 FR 2885)

In 2006, EPA invited eight major leading companies in PFAS industry to join in a global stewardship program (2010/2015 PFOA Stewardship Program) with two goals:

1. To commit to achieve, no later than 2010, a 95 percent reduction, measured from a year 2000 baseline, in both facility emissions to all media of PFOA, precursor chemicals that can break down to PFOA, and related higher homologue chemicals, and product content levels of these chemicals; and
2. To commit to working toward the elimination of these chemicals from emissions and products by 2015.

Participants in the Stewardship Program included

- Arkema
- Asahi Glass Company
- BASF Corporation (successor to Ciba Specialty Chemicals Corporation)
- Clariant

- Daikin
- 3M/Dyneon
- DuPont
- Solvay Solexis

At the time of initiation of the Stewardship Program, these companies represented the majors global manufacturers of long-chain PFCAs. All companies have met the PFOA Stewardship Program goals. Final progress reports are available on EPA's website.<sup>8</sup>

Table 2-3 present the number of active non-CBI and CBI PFAS in the Inventory with any associated regulatory flags. Table 2-3 also indicates if the CBI PFAS is provisional. The regulatory flags provide an indication of rulemakings that impact PFAS in the Inventory and reporting requirements for manufactured or imported PFAS. A total of 202 PFAS are identified in final SNURs, 145 non-CBI PFAS and 57 CBI PFAS (see Table 2-3).

<b>Table 2-3: Regulatory Flags for Active TSCA Inventory PFAS<sup>1</sup></b>							
<b>PFAS Category</b>	<b>Total</b>	<b>PMN</b>	<b>5E</b>	<b>S</b>	<b>SP</b>	<b>XU</b>	<b>FRI</b>
<b>Non-CBI</b>							
perfluoroalkyl carbonyl compounds (e.g., PFCA)	22	0	0	8	3	0	0
perfluoroalkane sulfonyl compounds (e.g., PFSA)	68	7	3	51	0	1	0
perfluoroalkyl phosphate compounds (e.g., PFPA)	2	0	0	2	0	0	0
fluorotelomer-related compounds (e.g., FTT)	97	30	3	67	17	3	0
per- and polyfluoroalkyl ether-based compounds (e.g. PFECA)	31	18	4	5	0	9	0
other PFAA precursors and related compounds - perfluoroalkyl ones	22	5	1	2	0	1	0
other PFAA precursors or related compounds – semi fluorinated (e.g., HFE)	13	12	0	5	0	0	0
fluoropolymers (e.g., PTFE)	40	25	13	2	0	26	1
Not Classified	27	13	0	3	0	6	0
<b>Subtotal</b>	<b>322</b>	<b>110</b>	<b>24</b>	<b>145</b>	<b>20</b>	<b>46</b>	<b>1</b>
<b>CBI</b>							
Provisional Status							
<i>Yes</i>	45	44	42	34	0	0	0
<i>No</i>	184	184	75	23	3	77	5
<b>Subtotal</b>	<b>229</b>	<b>228</b>	<b>117</b>	<b>57</b>	<b>3</b>	<b>77</b>	<b>5</b>
<b>Non-CBI and CBI</b>							
<b>Total</b>	<b>551</b>	<b>338</b>	<b>141</b>	<b>202</b>	<b>23</b>	<b>123</b>	<b>6</b>
<b>Note(s):</b> <sup>1</sup> Regulatory Flags: PMN - indicates a commenced PMN substance; 5E - indicates a substance that is subject of a TSCA section 5(e) order; S - indicates a substance that is identified in a final Significant New use Rule; SP - indicates a substance that is identified in a proposed Significant New Use Rule; XU -indicates a substance exempt from reporting under the Chemical Data Reporting Rule. (40 CFR 711); FRI - indicates a polymeric substance containing no free-radical initiator in its Inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.							

<sup>8</sup> <https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/epas-non-cbi-summary-tables-2015-company-progress>

### 3. Manufacturing and Import of PFAS

Manufacturers and Importers of PFAS chemicals were identified by searching the CDR and the Toxics Release Inventory (TRI). CDR was searched to identify PFAS parent companies that reported manufacturing and/or importing PFAS(s) in the non-CBI 2016 CDR. A total of 14 parent companies were identified and are presented in Table 3-1. Four of these 14 parent companies: 3M Company, AGC Chemicals America, Inc., Daikin America, Inc and Solvay Specialty Polymers USA, LLC took part in the PFOA Stewardship Program (see Chapter 2).

Table 3-2 presents the PFAS parent companies, their related manufacturing sites, and the number of PFAS reported at each site as reported in the 2016 CDR. A total of 31 sites reported 90 different PFAS. One site and at least one parent company are listed as CBI. The Chemours Company manufactured the largest number of PFAS (39 different PFAS). Appendix B, Table B-1 presents the combined manufacture and import volume as well as the national aggregate production volume for each PFAS reported in the 2016 CDR. The manufacturing and import volumes for all PFAS reported were withheld and only 18 of the 90 PFAS reported provide a range of national aggregate production volume (see Table B-1).

<b>Table 3-1: Parent Companies Reporting PFAS in the 2016 CDR</b>
<b>Parent Company<sup>1</sup></b>
3M COMPANY
AGC CHEMICALS AMERICAS, INC.
ATOTECH USA, INC.
DAIKIN AMERICA, INC.
Dow Corning Corporation
FORD MOTOR COMPANY
HONEYWELL INTERNATIONAL INC
LANXESS CORPORATION
LINDE NORTH AMERICA, INC
PEACH STATE LABS INC
SOLVAY SPECIALTY POLYMERS USA, LLC
SUMITOMO CORPORATION OF AMERICAS
The Chemours Co
TYCO FIRE PRODUCTS LP
<b>Note(s):</b>
<sup>1</sup> Two parent companies were removed because they appeared to be duplicates with slightly different spellings.

Table 3-2: Number of PFAS Chemicals Manufactured by Parent Company and Site in the 2016 CDR				
Parent Company	Manufacturing Site Name	Site State	Number of Chemicals Manufactured	
			Parent Company	Site
3M COMPANY	3M COMPANY	MN	4	3
3M COMPANY	3M COMPANY/3M CORDOVA	IL	4	1
AGC CHEMICALS AMERICAS, INC.	AGC CHEM AMER INC BUS & TECH CTR	PA	4	4
ATOTECH USA, INC.	ATOTECH USA	SC	2	2
CBI	3M COMPANY	AL	CBI	4
CBI	3M COMPANY/3M CORDOVA	IL	CBI	13
CBI	3M COTTAGE GROVE CENTER	MN	CBI	2
CBI	AIR PROD & CHEM HAMILTON BLVD FAC	PA	CBI	2
CBI	CBI	CBI	CBI	12
CBI	INNOVATIVE CHEMICAL TECHNOLOGIES INC	GA	CBI	4
CBI	INNOVATIVE CHEMICAL TECHNOLOGY AT ORTEC INC	SC	CBI	1
CBI	SOLENIS LLC	DE	CBI	1
CBI	THE CHEMOURS COMPANY FC, LLC (FAYETTEVILLE WORKS)	NC	CBI	10
DAIKIN AMERICA INC.	DAIKIN AMERICA INC.	NY	1	1
DAIKIN AMERICA, INC.	DAIKIN AMERICA, INC.	AL	8	8
Dow Corning Corporation	DOW CORNING CORP MIDLAND PLANT	MI	1	1
FORD MOTOR COMPANY	Ford Motor Company	MI	1	1
HONEYWELL INTERNATIONAL INC	HONEYWELL INTERNATIONAL INC - BATON ROUGE PLANT	LA	1	1
LANXESS CORPORATION	LANXESS CORP	PA	1	1
LINDE NORTH AMERICA, INC	LINDE ELECTRONICS AND SPECIALTY GASES	NJ	1	1
PEACH STATE LABS INC	PEACH STATE LABS INC COLUMBUS	GA	2	2
Peach State Labs LLC	PEACH STATE LABS, LLC	GA	4	4
SOLVAY SPECIALTY POLYMERS USA, LLC	SOLVAY SPECIALTY POLYMERS USA LLC	TX	2	1
SOLVAY SPECIALTY POLYMERS USA, LLC	SOLVAY SPECIALTY POLYMERS USA, LLC	GA	2	1
SUMITOMO CORPORATION OF AMERICAS	SUMITOMO CORPORATION OF AMERICAS	TX	1	1
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	39	21
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CORPUS CHRISTI)	TX	39	1
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (FAYETTEVILLE WORKS)	NC	39	3
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (HEADQUARTERS)	DE	39	5
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (PASCAGOULA)	MS	39	2
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (WASHINGTON WORKS)	WV	39	7
TYCO FIRE PRODUCTS LP	CHEMGUARD INC	TX	8	8
<b>Number of Unique Chemicals</b>				<b>90</b>

The 2016 TRI List of Reportable Chemicals contained five of the 824 PFAS chemicals identified by EPA (see Table 3-3). Table 3-4 presents the facilities reporting PFAS in the 2016 TRI. Of the five TRI reportable PFAS chemicals, two were reported by nine facilities in the 2016 TRI. Four facilities produce the chemicals that they reported. PFAS as a category of chemicals are not reported to the Toxic Release Inventory. As for the five that are listed, those are among the many CFCs and HCFCs that EPA was petitioned to add during the 1990s.

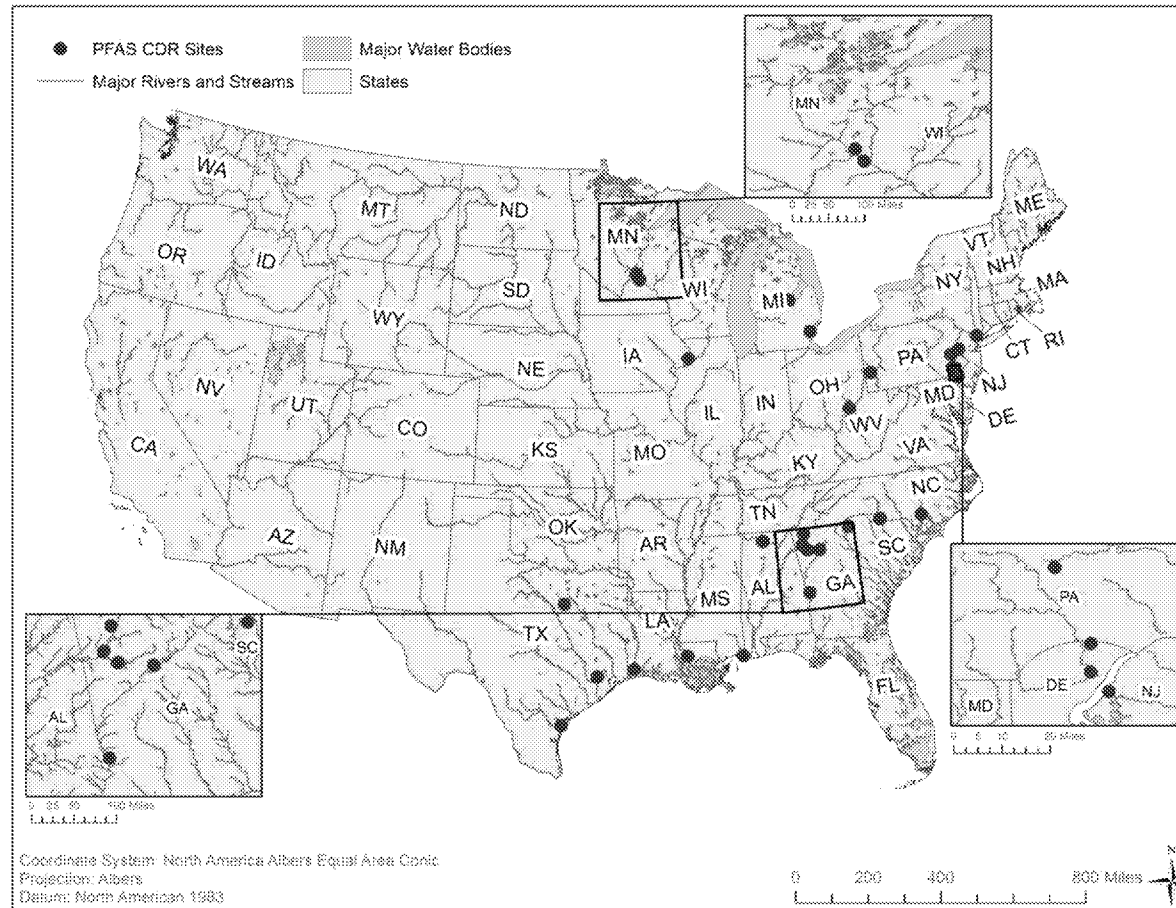
Figure 3-1 provides a U.S. map illustrating the location of the importing and manufacturing sites as indicated in the 2016 CDR. The map also shows waterbodies of greater than 10 square miles in proximity to the sites.

<b>Table 3-3: PFAS on the 2016 TRI List of Reportable Chemicals</b>		
<b>CAS</b>	<b>Chemical</b>	<b>Reported in 2016 TRI</b>
124-73-2	Dibromotetrafluoroethane (Halon 2402)	No
507-55-1	1,3-Dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb)	No
422-56-0	3,3-Dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca)	No
76-14-2	Dichlorotetrafluoroethane (CFC-114)	Yes
76-15-3	Monochloropentafluoroethane (CFC-115)	Yes

Table 3-4: Facilities Reporting PFAS in the 2016 TRI						
Parent Company Name	Manufacturing Facility Name	Manufacturing Facility Address	CAS	Chemical Name	Produce	Import
A-GAS US HOLDINGS INC	A-GAS AMERICAS	1100 HASKINS RD WOOD, OH 43402	76142	DICHLOROTETRAFLUOROETHANE (CFC-114)	NO	NO
AIRGAS INC	AIRGAS REFRIGERANTS INC SMYRNA	5211 INDUSTRIAL CT SE COBB, GA 30080	76142	DICHLOROTETRAFLUOROETHANE (CFC-114)	NO	NO
HERITAGE-WTI LLC	HERITAGE THERMAL SERVICES	1250 ST GEORGE ST COLUMBIANA, OH 43920	76142	DICHLOROTETRAFLUOROETHANE (CFC-114)	NO	NO
HONEYWELL INTERNATIONAL INC	HONEYWELL INTERNATIONAL INC DANVILLE WORKS	209 BREWER RD VERMILION, IL 61834	76142	DICHLOROTETRAFLUOROETHANE (CFC-114)	NO	NO
HONEYWELL INTERNATIONAL INC	HONEYWELL INTERNATIONAL INC GEISMAR PLANT	5525 HWY 3115 ASCENSION PARISH, LA 70721	76142	DICHLOROTETRAFLUOROETHANE (CFC-114)	YES	NO
HONEYWELL INTERNATIONAL INC	HONEYWELL INTERNATIONAL INC GEISMAR PLANT	5525 HWY 3115 ASCENSION PARISH, LA 70721	76153	MONOCHLOROPENTAFLUOROETHANE	YES	NO
HONEYWELL INTERNATIONAL INC	HONEYWELL INTERNATIONAL INC-BATON ROUGE PLANT	CORNER OF LUPINE & ONTARIO STR EETS EAST BATON ROUGE PARISH, LA 70805	76142	DICHLOROTETRAFLUOROETHANE (CFC-114)	YES	NO
THE CHEMOURS CO	CHEMOURS WASHINGTON WORKS	8480 DUPONT RD BUILDING 1 WOOD, WV 26181	76142	DICHLOROTETRAFLUOROETHANE (CFC-114)	YES	NO
THE CHEMOURS CO FC LLC	THE CHEMOURS CO FC LLC	HWY 361 SAN PATRICIO, TX 78359	76142	DICHLOROTETRAFLUOROETHANE (CFC-114)	YES	NO
THE CHEMOURS CO FC LLC	THE CHEMOURS CO FC LLC	HWY 361 SAN PATRICIO, TX 78359	76153	MONOCHLOROPENTAFLUOROETHANE	YES	NO
US DEPARTMENT OF DEFENSE	US DEFENSE LOGISTICS AGENCY DEFENSE SUPPLY CENTER RICHMOND	8000 JEFFERSON DAVIS HWY CHESTERFIELD, VA 23297	76142	DICHLOROTETRAFLUOROETHANE (CFC-114)	NO	NO
Source(s): EPA (2017)						



Figure 3-1: Location of 2016 PFAS CDR Manufacturing and Importing Sites



**Note(s):**

<sup>1</sup> The source of the main water bodies and rivers and streams data is a 2014 U.S. Geological Survey (USGS) dataset that includes data on streams and water bodies and wetlands within the contiguous U.S. at a 1:1,000,000 scale.

<sup>2</sup> There are no PFAS sites outside of the contiguous U.S.

## 4. Uses of PFAS Chemicals

PFAS are a broad class of substances with differing structural features (e.g. varying carbon lengths, differing fluorine content and functional groups) that can impart special properties that have a variety of industrial applications. PFAS provide characteristics such as thermo-stability, ability to adapt to a variety of surface characteristics, high chemical stability, and other characteristics. Fluoropolymers, in particular, have properties that include fire resistance and oil, stain, grease, and water repellency. Fluorotelomers can be used in surface treatment products and impart the following properties: soil, stain, grease, and water resistance. Fluorotelomers can also be used as surfactants to help products flow more evenly (EPA 2009). Table 4-1 presents a list of broad use categories with examples for each use category.

Table 4-1: Summary of PFAS Uses and Applications	
Use Category	Example(s)
Adhesive, paint, and coating additive	Nonstick coating in cookware
Chemical manufacturing	Chemical intermediate; polymerization aid
Component of a photoresist substance	Semiconductors
Component of electronic products	Cables and wiring; insulating tape; “solder sleeves”; smudge-resistant touch screens
Component of firefighting foams	Aqueous film-forming foams (AFFFs)
Component of rubber compounds	Hose, tubing, and piping; rubber and plumbing fluxing agents
Foam additive	Flame-retardant insulation in soft furnishings
Lubricant and lubricant additive	Automotive manufacturing
Specialized industrial chemical	Improved mold release for pneumatic tires; liquid crystal displays; wetting agents
Mechanical components	Conveyor belting; low-friction bearings and seals; coating/surfactant on semiconductors, wiring, tubing, seals, etc.
Clothing, footwear, and textiles	Protection against oil, water, and soil; wind and rain barrier; firefighting clothing
Scientific and medical instruments	Photographic film; x-ray film; artificial body parts; medical product packaging
Wetting agent	Floor polishes; metal plating
<b>Source(s):</b> EPA (2013, 2016, 2018a); OECD (2013); FluoroCouncil (2018)	

Table 4-2 presents the industrial sectors associated with PFAS reported in the 2016 CDR. The sectors with the largest number of chemicals included all other basic organic chemical manufacturing (19), all other chemical product and preparation manufacturing (19), plastic material and resin manufacturing (17), and computer and electronic product manufacturing (16). A total of 33 entries were blank and 15 reported as CBI. Table 4-3 provides the number of PFAS by chemical function as reported in the 2016 CDR. This includes the highest categories as intermediates (29), functional fluids (10), solvents (for cleaning and degreasing) (9), and firefighting foam agents (8). A total of 33 entries were blank and 15 reported as CBI. Appendix B, Table B-2 presents the combined use, function, and sector information for all PFAS reported in the 2016 CDR. However, little can be concluded without the production volumes corresponding to each use.

Table 4-4 presents the number of PFAS reported for product categories reported in the 2016 CDR, and whether the product is used in the consumer and/or commercial sector. The majority (76) had

blank entries. The largest number of chemicals were reported to firefighting foam agents (8), electrical and electronic components (5), and cleaning and furnishing care products (4).

<b>Table 4-2: Number of PFAS Manufactured by Sector Reported in the 2016 CDR</b>	
<b>Sector</b>	<b>Number of PFAS</b>
(blank)	33
CBI	15
Adhesive manufacturing	2
All other basic inorganic chemical manufacturing	1
All other basic organic chemical manufacturing	19
All other chemical product and preparation manufacturing	19
Computer and electronic product manufacturing	16
Fabricated metal product manufacturing	2
Industrial gas manufacturing	2
Miscellaneous manufacturing	4
Not known or reasonably ascertainable	2
Oil and gas drilling, extraction, and support activities	1
Paint and coating manufacturing	4
Paper manufacturing	1
Pesticide, fertilizer, and other agricultural chemical manufacturing	2
Plastic material and resin manufacturing	17
Primary metal manufacturing	1
Printing ink manufacturing	1
resale of chemicals	1
Soap, cleaning compound, and toilet preparation manufacturing	3
Stored on site in rail cars, no commercial use	1
Textiles, apparel, and leather manufacturing	5
Wholesale and retail trade	1

<b>Table 4-3: Number of PFAS Manufactured by Function Reported in the 2016 CDR</b>	
<b>Function</b>	<b>Number of PFAS</b>
(blank)	33
CBI	15
Finishing agents	2
Fire Extinguishing Medium	1
Firefighting foam agents	8
Functional fluids (closed systems)	10
Functional fluids (open systems)	3
Intermediates	29
Lubricants and lubricant additives	1
Not known or reasonably ascertainable	1
Paint additives and coating additives not described by other categories	1
Plating agents and surface treating agents	4
Processing aids, not otherwise listed	5
Processing aids, specific to petroleum production	1
Solvents (for cleaning and degreasing)	9
Solvents (which become part of product formulation or mixture)	1
Stored on site in rail cars, no commercial use	1
Surface active agents	7
Transfilling and purifying	1

<b>Table 4-4: Number of PFAS by Use Category as Reported in the 2016 CDR</b>		
<b>Product Category</b>	<b>Consumer/Commercial/Both</b>	<b>Number of PFAS</b>
(blank)	(blank)	76
CBI	Commercial	2
Adhesives and sealants	Commercial	1
Automotive care products	Consumer	1
Cleaning and furnishing care products	Both	4
Electrical and electronic products	Commercial	5
Fabric, textile, and leather products not covered elsewhere	Both	1
Fire Extinguishing medium	Commercial	1
Firefighting foam agents	Commercial	8
Food packaging	Both	1
Ink, toner, and colorant products	Consumer	1
Metal products not covered elsewhere	Both	2
Paints and coatings	Both	1

To gain further perspective on recent uses of PFAS, Table 4-5 presents TSCA submission types (including LVEs, premanufacture notices (PMNs), SNUNS, LOREX and TMAs) between 2006 through 2016 and their related use categories and production volume. Thirteen major uses categories are noted. Lubricant and lubricant additive and component of rubber compounds uses categories represent the highest average annual production volume (229,100 kg and 212,200 kg, respectively).

**Table 4-5: Categories of Use by Submission Type (FY 2006 to 2016)<sup>1</sup>**

Use	LVE	PMN	SNUN	LOREX	TMEA	Average Annual Production Volume (kg/yr) <sup>2</sup>
Adhesive, paint, and coating additive	74	41	2	-	1	13,100
Chemical Intermediate	38	37	-	-	-	12,700
Component of a photoresist substance	99	4	-	1	-	1,600
Component of electronic products	7	5	-	-	-	20,400
Component of firefighting foams	-	10	-	-	-	52,800
Component of rubber compounds	5	5	-	-	-	212,200
Cross-linking agent	1	1	-	-	-	1,000
Finishing agents	64	144	2	-	-	48,100
Foam additive	3	4	-	-	-	15,600
Lubricant and Lubricant Additive	15	5	-	-	-	229,100
Polymerization Aid	7	8	-	-	-	8,000
Specialized Industrial Chemical	8	8	-	-	-	13,400
Tracer Chemical	27	-	-	-	-	400
<b>Total</b>	<b>348</b>	<b>272</b>	<b>4</b>	<b>1</b>	<b>1</b>	

**Note(s):**

<sup>1</sup> PMN - Premanufacture Notices; SNUN - Significant New Use Notices; LVE - Low Volume Exemptions; LM - Low Volume Exemption Modifications; LOREX - Low Exposure/Low Release Exemptions; XM - Low Exposure/Low Release Exemption Modifications; TMEA - Test Marketing Exemption Applications.

<sup>2</sup> Reflects average annual production volume for all notice types

<sup>3</sup> Due to the implementation of the PFOA Stewardship Program between the reported years, the average annual production volumes may not be an accurate indicator of the current PFAS use trends.

## Appendix A: PFAS Categories

**Table A-1: PFAS Categories<sup>1</sup>**

<b>perfluoroalkyl carbonyl compounds</b>
perfluoroalkyl carbonyl halides
perfluoroalkyl carboxylic acids (PFCAs), their salts and esters
other perfluoroalkyl carbonyl-based nonpolymers
perfluoroalkyl carbonyl amides / amido ethanols and other alcohols
perfluoroalkyl carbonyl silanes
perfluoroalkyl carbonyl (meth)acrylate
other perfluoroalkyl carbonyl-based side-chain fluorinated polymers
perfluoroalkyl carbonyl (meth)acrylate polymers
perfluoroalkyl carbonyl dicarbonyl halides
perfluoroalkyl carbonyl dicarboxylic acids and non-polymers
1-H perfluoroalkyl carbonyl halides
1-H perfluoroalkyl carboxylic acids
1-H perfluoroalkyl carbonyl-based non-polymers
<b>perfluoroalkane sulfonyl compounds</b>
perfluoroalkane sulfonyl halides
perfluoroalkane sulfonic acids (PFSAs), their salts and esters
perfluoroalkane sulfonyl-based nonpolymers
perfluoroalkane sulfonyl amides/amido ethanols (xPASA/Es) and other alcohols
perfluoroalkane sulfonyl amido ethanols, phosphate esters (SAMPAPs)
perfluoroalkane sulfonyl (meth)acrylates
perfluoroalkane sulfonyl silanes
perfluoroalkane sulfonyl acetic acids & esters
perfluoroalkane sulfonyl-based side-chain fluorinated polymers
perfluoroalkane sulfonyl (meth)acrylate polymers
perfluoroalkane sulfonyl urethane polymers
perfluoroalkane sulfonyl siloxanes/silicon polymers
perfluoroalkane sulfinic acids
1-H perfluoroalkane sulfonic acids
1-H perfluoroalkane sulfonyl-based non-polymers
perfluoroalkane disulfonic acids
perfluoroalkane disulfonyl-based non-polymers
<b>perfluoroalkyl phosphate compounds</b>
perfluoroalkyl phosphate-related halides
bis(perfluoroalkyl) phosphinyl halides
perfluoroalkyl phosphorus halides
perfluoroalkyl phosphonic acids (PFPA), their salts and esters
perfluoroalkyl phosphinic acids (PFPIAs), their salts and esters
bis(perfluoroalkyl) phosphinyl-based nonpolymers
bis(perfluoroalkyl) phosphinyl amids (PFPIAMs)
<b>fluorotelomer-related compounds</b>
perfluoroalkyl iodides (PFAIs)
n:2 fluorotelomer-based non-polymers
n:2 fluorotelomer iodides (n:2 FTIs)
n:2 fluorotelomer olefins (n:2 FTOs)
n:2 fluorotelomer alcohols (n:2 FTOHs) / thiols
n:2 fluorotelomer alcohol, phosphate esters (PAPs)
n:2 fluorotelomer-based silanes
n:2 fluorotelomer-based (meth)acrylate
n:2 fluorotelomer sulfonic acids (n:2 FTSAs)
n:2 fluorotelomer sulfonyl-based compounds
n:2 fluorotelomer phosphonic / phosphinic acids
n:2 FTOH ethoxylates
n:2 FT amine, amino & derivatives
n:2 FT-thiol derivatives

**Table A-1. PFAS Categories<sup>1</sup>**

n:2 fluorotelomer carboxylic acids (FTCAs)
n:3 acids
FTAL
n:2 fluorotelomer-based side-chain fluorinated polymers
n:2 fluorotelomer-based (meth)acrylate polymers
n:2 fluorotelomer-based urethane polymers
n:2 fluorotelomer-based siloxanes/silicon polymers
n:2 fluorotelomer-based sulfonyl (meth)acrylate polymers
n:1 fluorotelomer-based non-polymers
n:1 fluorotelomer alcohols
n:1 FT (meth)acrylate
n:1 PAPs
n:1 silanes
n:1 FT sulfonyl-based substances
n:1 FTAL
n:1 fluorotelomer-based side-chain fluorinated polymers
n:1 fluorotelomer-based (meth)acrylic polymers
fluorotelomer epoxides and derivatives
fluorotelomer epoxides
fluorotelomer epoxides derivatives
Hydrofluorotelomer non-polymers
hydrofluorotelomer-based side chain fluorinated polymers
perfluoroalkyl diiodides
1-H n:1 FT
<b>per- and polyfluoroalkyl ether-based compounds</b>
perfluoroalkyl ethers / alkanes + aromatics
perfluoroalkyl ethers / alkanes + aromatics – monoethers
perfluoroalkyl ethers / alkanes + aromatics – diethers
perfluoroalkyl ethers / alkanes + aromatics – triethers
perfluoroalkyl ethers / alkanes + aromatics - 4-10 ether linkages
perfluoroalkyl ethers / alkanes + aromatics - more than 10 ether linkages
per- and polyfluoroalkyl ether carboxylic acids (PFECAs), their salts and esters, as well as derivatives such as amides
PFECAs, salts and esters – monoethers
PFECAs, salts and esters – diethers
PFECAs, salts and esters – triethers
PFECAs, salts and esters - 4-10 ether linkages
PFECAs, salts and esters - more than 10 ether linkages
PFECA-related substances – monoethers
PFECA-related substances – diethers
PFECA-related substances – triethers
PFECA-related substances - 4-10 ether linkages
PFECA-related substances - more than 10 ether linkages
per- and polyfluoroalkyl ether sulfonic acids (PFESAs), their salts and esters, as well as derivatives
PFESAs, salts and esters – monoethers
PFESAs, salts and esters – diethers
PFESAs, salts and esters – triethers
PFESAs, salts and esters - 4-10 ether linkages
PFESAs, salts and esters - more than 10 ether linkages
PFESA-related substances – monoethers
PFESA-related substances – diethers
PFESA-related substances – triethers
PFESA-related substances - 4-10 ether linkages
PFESA-related substances - more than 10 ether linkages
perfluoroethers alkenes and derivatives
perfluoroethers alkenes and derivatives – monoethers
perfluoroethers alkenes and derivatives – diethers

**Table A-1. PFAS Categories<sup>1</sup>**

perfluoroethers alkenes and derivatives – triethers
perfluoroethers alkenes and derivatives - 4-10 ether linkages
perfluoroethers alkenes and derivatives - more than 10 ether linkages
per- and polyfluoroalkyl ether halides (except F)
per- and polyfluoroalkyl ether halides (except F) – monoethers
per- and polyfluoroalkyl ether halides (except F) – diethers
per- and polyfluoroalkyl ether halides (except F) – triethers
per- and polyfluoroalkyl ether halides (except F) - 4-10 ether linkages
per- and polyfluoroalkyl ether halides (except F) - more than 10 ether linkages
per - and polyfluoroalkyl ether + telomer-based substances
per - and polyfluoroalkyl ether + telomer-based substances - monoethers
per - and polyfluoroalkyl ether + telomer-based substances - diethers
per - and polyfluoroalkyl ether + telomer-based substances - triethers
per - and polyfluoroalkyl ether + telomer-based substances - 4-10 ether linkages
per - and polyfluoroalkyl ether + telomer-based substances - more than 10 ether linkages
other per- and polyfluoroalkyl ether-based compounds
other per- and polyfluoroalkyl ether-based compounds - monoethers
other per- and polyfluoroalkyl ether-based compounds - diethers
other per- and polyfluoroalkyl ether-based compounds - triethers
other per- and polyfluoroalkyl ether-based compounds - 4-10 ether linkages
other per- and polyfluoroalkyl ether-based compounds - more than 10 ether linkages
<b>other PFAA precursors and related compounds - perfluoroalkyl ones</b>
perfluoroalkyl silanes
perfluoroalkyl alcohols
perfluoroalkyl alcohol-based side-chain fluorinated polymers
perfluoroalkanes & aromatics
perfluoroalkenes & derivatives
perfluoroalkyl amines
perfluoroalkyl epoxides & derivatives
perfluoroalkyl ketones
perfluoroalkyl halides (other than iodides)
perfluoroalkyl radicals
perfluoroalkyl cyanide
perfluoroalkyl metal
perfluoroalkyl thiol and derivatives
perfluoroalkyl sulfide
<b>other PFAA precursors or related compounds - semi fluorinated</b>
hydrofluorocarbons (HFCs), semi fluorinated alkanes (SFAs) and their derivatives
HFCs and derivatives
SFAs and derivatives
hydrofluoroethers (HFEs) and derivatives
HFEs
HFE-based silanes
other HFE-based derivatives
hydrofluoroolefins (HFOs)
semi-fluorinated ketones
side-chain fluorinated aromatics
<b>fluoropolymers</b>
polytetrafluoroethylene (PTFE)
non-functionalized PTFE
functionalized PTFE
polyvinylidene fluoride (PVDF)
non-functionalized PVDF
functionalized PVDF
fluorinated ethylene propylene (FEP)
perfluoroalkoxyl polymer (PFA)
polyvinyl fluoride (PVF)
Ethylene tetrafluoroethylene (ETFE)



Table A-1: PFAS Categories <sup>1</sup>
VDF-HFP
PCTFE
THV
oxetane polymer
<b>Note(s):</b> <sup>1</sup> Categories as presented in OECD (2018a)

## Appendix B: 2016 CDR PFAS Reporting

**Table B-1: PFAS Manufacture and Import Reported in the 2016 CDR**

Parent Company	Site Name	Site State	CAS	Chemical Name	Manufacture and Import	National Aggregate PV
3M COMPANY	3M COMPANY	MN	311-89-7	1-Butanamine, 1,1,2,2,3,3,4,4,4-nonafluoro-N,N-bis(1,1,2,2,3,3,4,4,4-nonafluorobutyl)-	Withheld	Withheld
3M COMPANY	3M COMPANY	MN	34454-97-2	1-Butanesulfonamide, 1,1,2,2,3,3,4,4,4-nonafluoro-N-(2-hydroxyethyl)-N-methyl-	Withheld	Withheld
3M COMPANY	3M COMPANY	MN	86508-42-1	Perfluoro compounds, C5-18	Withheld	Withheld
3M COMPANY	3M COMPANY/3M CORDOVA	IL	132182-92-4	Pentane, 1,1,1,2,2,3,4,5,5,5-decafluoro-3-methoxy-4-(trifluoromethyl)-	Withheld	Withheld
AGC CHEMICALS AMERICAS, INC.	AGC CHEM AMER INC BUS & TECH CTR	PA	2043-57-4	Octane, 1,1,1,2,2,3,3,4,4,5,5,6,6-tridecafluoro-8-iodo-	Withheld	1,000,000 - 10,000,000 lb
AGC CHEMICALS AMERICAS, INC.	AGC CHEM AMER INC BUS & TECH CTR	PA	355-43-1	Hexane, 1,1,1,2,2,3,3,4,4,5,5,6,6-tridecafluoro-6-iodo-	Withheld	1,000,000 - 10,000,000 lb
AGC CHEMICALS AMERICAS, INC.	AGC CHEM AMER INC BUS & TECH CTR	PA	422-56-0	Propane, 3,3-dichloro-1,1,1,2,2-pentafluoro-	Withheld	< 25,000 lb
AGC CHEMICALS AMERICAS, INC.	AGC CHEM AMER INC BUS & TECH CTR	PA	507-55-1	Propane, 1,3-dichloro-1,1,2,2,3-pentafluoro-	Withheld	< 25,000 lb
ATOTECH USA, INC.	ATOTECH USA	SC	27619-97-2	1-Octanesulfonic acid, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluoro-	Withheld	Withheld
ATOTECH USA, INC.	ATOTECH USA	SC	56773-42-3	Ethanaminium, N,N,N-triethyl-, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-hepta-decafluoro-1-octanesulfonate (1:1)	Withheld	< 25,000 lb
CBI	3M COMPANY	AL	212335-64-3	2-Propenoic acid, reaction products with N-[3-(dimethylamino)propyl]-1,1,2,2,3,3,4,4,4-nonafluoro-1-butanesulfonamide	Withheld	Withheld

**Table B-1: PFAS Manufacture and Import Reported in the 2016 CDR**

Parent Company	Site Name	Site State	CAS	Chemical Name	Manufacture and Import	National Aggregate PV
CBI	3M COMPANY	AL	332350-90-0	Phosphonium, tributyl(2-methoxypropyl)-, salt with 1,1,2,2,3,3,4,4,4-nonafluoro-N-methyl-1-butanefulfonamide (1:1)	Withheld	Withheld
CBI	3M COMPANY	AL	332350-93-3	Phosphonium, triphenyl(phenylmethyl)-, salt with 1,1,2,2,3,3,4,4,4-nonafluoro-N-methyl-1-butanefulfonamide (1:1)	Withheld	Withheld
CBI	3M COMPANY	AL	34454-97-2	1-Butanesulfonamide, 1,1,2,2,3,3,4,4,4-nonafluoro-N-(2-hydroxyethyl)-N-methyl-	Withheld	Withheld
CBI	3M COMPANY/3M CORDOVA	IL	163702-05-4	Butane, 1-ethoxy-1,1,2,2,3,3,4,4,4-nonafluoro-	Withheld	Withheld
CBI	3M COMPANY/3M CORDOVA	IL	163702-06-5	Propane, 2-(ethoxydifluoromethyl)-1,1,1,2,3,3,3-heptafluoro-	Withheld	Withheld
CBI	3M COMPANY/3M CORDOVA	IL	163702-07-6	Butane, 1,1,1,2,2,3,3,4,4-nonafluoro-4-methoxy-	Withheld	Withheld
CBI	3M COMPANY/3M CORDOVA	IL	163702-08-7	Propane, 2-(difluoromethoxymethyl)-1,1,1,2,3,3,3-heptafluoro-	Withheld	Withheld
CBI	3M COMPANY/3M CORDOVA	IL	297730-93-9	Hexane, 3-ethoxy-1,1,1,2,3,4,4,5,5,6,6,6-dodecafluoro-2-(trifluoromethyl)-	Withheld	Withheld
CBI	3M COMPANY/3M CORDOVA	IL	335-42-2	Butanoyl fluoride, 2,2,3,3,4,4,4-heptafluoro-	Withheld	Withheld
CBI	3M COMPANY/3M CORDOVA	IL	375-03-1	Propane, 1,1,1,2,2,3,3,3-heptafluoro-3-methoxy-	Withheld	Withheld
CBI	3M COMPANY/3M CORDOVA	IL	375-72-4	1-Butanesulfonyl fluoride, 1,1,2,2,3,3,4,4,4-nonafluoro-	Withheld	Withheld
CBI	3M COMPANY/3M CORDOVA	IL	382-28-5	Morpholine, 2,2,3,3,5,5,6,6-octafluoro-4-(trifluoromethyl)-	Withheld	Withheld
CBI	3M COMPANY/3M CORDOVA	IL	756-13-8	3-Pentanone, 1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-	Withheld	Withheld
CBI	3M COMPANY/3M CORDOVA	IL	76-19-7	Propane, 1,1,1,2,2,3,3,3-octafluoro-	Withheld	Withheld
CBI	3M COMPANY/3M CORDOVA	IL	813-45-6	3-Hexanone, 1,1,1,2,4,4,5,5,6,6,6-undecafluoro-2-(trifluoromethyl)-	Withheld	Withheld
CBI	3M COMPANY/3M CORDOVA	IL	86508-42-1	Perfluoro compounds, C5-18	Withheld	Withheld

**Table B-1: PFAS Manufacture and Import Reported in the 2016 CDR**

Parent Company	Site Name	Site State	CAS	Chemical Name	Manufacture and Import	National Aggregate PV
CBI	3M COTTAGE GROVE CENTER	MN	375-03-1	Propane, 1,1,1,2,2,3,3-heptafluoro-3-methoxy-	Withheld	Withheld
CBI	3M COTTAGE GROVE CENTER	MN	484024-67-1	1-Butanesulfonamide, 1,1,2,2,3,3,4,4,4-nonafluoro-N-(2-hydroxyethyl)-, ammonium salt (1:1)	Withheld	Withheld
CBI	AIR PROD & CHEM HAMILTON BLVD FAC	PA	559-40-0	Cyclopentene, 1,2,3,3,4,4,5,5-octafluoro-	Withheld	Withheld
CBI	AIR PROD & CHEM HAMILTON BLVD FAC	PA	76-16-4	Ethane, 1,1,1,2,2,2-hexafluoro-	Withheld	Withheld
CBI	CBI	CBI	2043-54-1	Dodecane, 1,1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10-heneicosafuoro-12-iodo-	Withheld	Withheld
CBI	CBI	CBI	2043-57-4	Octane, 1,1,1,2,2,3,3,4,4,5,5,6,6-tridecafluoro-8-iodo-	Withheld	1,000,000 - 10,000,000 lb
CBI	CBI	CBI	27905-45-9	2-Propenoic acid, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluorodecyl ester	Withheld	< 25,000 lb
CBI	CBI	CBI	422-61-7	Propanoyl fluoride, 2,2,3,3,3-pentafluoro-	Withheld	Withheld
CBI	CBI	CBI	647-42-7	1-Octanol, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluoro-	Withheld	1,000,000 - 10,000,000 lb
CBI	CBI	CBI	67584-55-8	2-Propenoic acid, 2-[methyl[(1,1,2,2,3,3,4,4,4-nonafluorobutyl)sulfonyl]amino]ethyl ester	Withheld	Withheld
CBI	CBI	CBI	68140-18-1	Thiols, C4-10, .gamma.-.omega.-perfluoro	Withheld	Withheld
CBI	CBI	CBI	68140-20-5	Thiols, C6-12, .gamma.-.omega.-perfluoro	Withheld	Withheld
CBI	CBI	CBI	68187-47-3	1-Propanesulfonic acid, 2-methyl-, 2-[[1-oxo-3-[(.gamma.-.omega.-perfluoro-C4-16-alkyl)thio]propyl]amino] derivs., sodium salts	Withheld	Withheld
CBI	CBI	CBI	68391-08-2	Alcohols, C8-14, .gamma.-.omega.-perfluoro	Withheld	Withheld
CBI	CBI	CBI	70969-47-0	Thiols, C8-20, .gamma.-.omega.-perfluoro, telomers with acrylamide	Withheld	Withheld
CBI	CBI	CBI	70983-60-7	1-Propanaminium, 2-hydroxy-N,N,N-trimethyl-, 3-[(.gamma.-.omega.-perfluoro-C6-20-alkyl)thio] derivs., chlorides	Withheld	Withheld

**Table B-1: PFAS Manufacture and Import Reported in the 2016 CDR**

Parent Company	Site Name	Site State	CAS	Chemical Name	Manufacture and Import	National Aggregate PV
CBI	INNOVATIVE CHEMICAL TECHNOLOGIES INC	GA	142636-88-2	2-Propenoic acid, 2-methyl-, octadecyl ester, polymer with 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-heneicosafuorododecyl 2-propenoate, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluorodecyl 2-propenoate and 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,14-pentacosafuorotetradecyl 2-propenoate	Withheld	Withheld
CBI	INNOVATIVE CHEMICAL TECHNOLOGIES INC	GA	65545-80-4	Poly(oxy-1,2-ethanediyl), .alpha.-hydro-.omega.-hydroxy-, ether with .alpha.-fluoro-.omega.-(2-hydroxyethyl)poly(difluoromethylene) (1:1)	Withheld	25,000 - 100,000 lb
CBI	INNOVATIVE CHEMICAL TECHNOLOGIES INC	GA	68412-68-0	Phosphonic acid, perfluoro-C6-12-alkyl derivs.	Withheld	Withheld
CBI	INNOVATIVE CHEMICAL TECHNOLOGIES INC	GA	68412-69-1	Phosphinic acid, bis(perfluoro-C6-12-alkyl) derivs.	Withheld	Withheld
CBI	INNOVATIVE CHEMICAL TECHNOLOGY AT ORTEC INC	SC	142636-88-2	2-Propenoic acid, 2-methyl-, octadecyl ester, polymer with 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-heneicosafuorododecyl 2-propenoate, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluorodecyl 2-propenoate and 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,14-pentacosafuorotetradecyl 2-propenoate	Withheld	Withheld
CBI	SOLENIS LLC	DE	355-43-1	Hexane, 1,1,1,2,2,3,3,4,4,5,5,6,6-tridecafluoro-6-iodo-	Withheld	1,000,000 - 10,000,000 lb
CBI	THE CHEMOURS COMPANY FC, LLC (FAYETTEVILLE WORKS)	NC	10493-43-3	Ethene, 1,1,2-trifluoro-2-(1,1,2,2,2-pentafluoroethoxy)-	Withheld	Withheld
CBI	THE CHEMOURS COMPANY FC, LLC (FAYETTEVILLE WORKS)	NC	13252-13-6	Propanoic acid, 2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-	Withheld	Withheld

**Table B-1: PFAS Manufacture and Import Reported in the 2016 CDR**

Parent Company	Site Name	Site State	CAS	Chemical Name	Manufacture and Import	National Aggregate PV
CBI	THE CHEMOURS COMPANY FC, LLC (FAYETTEVILLE WORKS)	NC	16090-14-5	Ethanesulfonyl fluoride, 2-[1-[difluoro[(1,2,2-trifluoroethenyl)oxy]methyl]-1,2,2,2-tetrafluoroethoxy]-1,1,2,2-tetrafluoro-	Withheld	Withheld
CBI	THE CHEMOURS COMPANY FC, LLC (FAYETTEVILLE WORKS)	NC	1623-05-8	Propane, 1,1,1,2,2,3,3-heptafluoro-3-[(1,2,2-trifluoroethenyl)oxy]-	Withheld	Withheld
CBI	THE CHEMOURS COMPANY FC, LLC (FAYETTEVILLE WORKS)	NC	2062-98-8	Propanoyl fluoride, 2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-	Withheld	Withheld
CBI	THE CHEMOURS COMPANY FC, LLC (FAYETTEVILLE WORKS)	NC	3330-14-1	Propane, 1-[1-[difluoro(1,2,2,2-tetrafluoroethoxy)methyl]-1,2,2,2-tetrafluoroethoxy]-1,1,2,2,3,3,3-heptafluoro-	Withheld	Withheld
CBI	THE CHEMOURS COMPANY FC, LLC (FAYETTEVILLE WORKS)	NC	3825-26-1	Octanoic acid, 2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-pentadecafluoro-, ammonium salt (1:1)	Withheld	Withheld
CBI	THE CHEMOURS COMPANY FC, LLC (FAYETTEVILLE WORKS)	NC	4089-58-1	Propanoyl fluoride, 2,3,3,3-tetrafluoro-2-[1,1,2,3,3,3-hexafluoro-2-[1,1,2,2-tetrafluoro-2-(fluorosulfonyl)ethoxy]propoxy]-	Withheld	Withheld
CBI	THE CHEMOURS COMPANY FC, LLC (FAYETTEVILLE WORKS)	NC	62037-80-3	Propanoic acid, 2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-, ammonium salt (1:1)	Withheld	Withheld
CBI	THE CHEMOURS COMPANY FC, LLC (FAYETTEVILLE WORKS)	NC	69116-73-0	Propanoic acid, 3-[1-[difluoro[1,2,2,2-tetrafluoro-1-(fluorocarbonyl)ethoxy]methyl]-1,2,2,2-tetrafluoroethoxy]-2,2,3,3-tetrafluoro-, methyl ester	Withheld	Withheld
DAIKIN AMERICA INC.	DAIKIN AMERICA INC.	NY	2043-57-4	Octane, 1,1,1,2,2,3,3,4,4,5,5,6,6-tridecafluoro-8-iodo-	Withheld	1,000,000 - 10,000,000 lb

**Table B-1: PFAS Manufacture and Import Reported in the 2016 CDR**

Parent Company	Site Name	Site State	CAS	Chemical Name	Manufacture and Import	National Aggregate PV
DAIKIN AMERICA, INC.	DAIKIN AMERICA, INC.	AL	115-25-3	Cyclobutane, 1,1,2,2,3,3,4,4-octafluoro-	Withheld	1,000,000 - 10,000,000 lb
DAIKIN AMERICA, INC.	DAIKIN AMERICA, INC.	AL	1547-26-8	1-Pentene, 2,3,3,4,4,5,5-heptafluoro-	Withheld	Withheld
DAIKIN AMERICA, INC.	DAIKIN AMERICA, INC.	AL	1623-05-8	Propane, 1,1,1,2,2,3,3-heptafluoro-3-[(1,2,2-trifluoroethenyl)oxy]-	Withheld	Withheld
DAIKIN AMERICA, INC.	DAIKIN AMERICA, INC.	AL	17527-29-6	2-Propenoic acid, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl ester	Withheld	1,000,000 - 10,000,000 lb
DAIKIN AMERICA, INC.	DAIKIN AMERICA, INC.	AL	17741-60-5	2-Propenoic acid, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-heneicosafuorododecyl ester	Withheld	Withheld
DAIKIN AMERICA, INC.	DAIKIN AMERICA, INC.	AL	2144-53-8	2-Propenoic acid, 2-methyl-, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl ester	Withheld	Withheld
DAIKIN AMERICA, INC.	DAIKIN AMERICA, INC.	AL	25291-17-2	1-Octene, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluoro-	Withheld	Withheld
DAIKIN AMERICA, INC.	DAIKIN AMERICA, INC.	AL	27905-45-9	2-Propenoic acid, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluorodecyl ester	Withheld	< 25,000 lb
Dow Corning Corporation	DOW CORNING CORP MIDLAND PLANT	MI	125476-71-3	Silicic acid (H <sub>4</sub> SiO <sub>4</sub> ), sodium salt (1:2), reaction products with chlorotrimethylsilane and 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro-1-decanol	Withheld	Withheld
FORD MOTOR COMPANY	Ford Motor Company	MI	65545-80-4	Poly(oxy-1,2-ethanediyl), .alpha.-hydro-.omega.-hydroxy-, ether with .alpha.-fluoro-.omega.-(2-hydroxyethyl)poly(difluoromethylene) (1:1)	Withheld	25,000 - 100,000 lb
HONEYWELL INTERNATIONAL INC	HONEYWELL INTERNATIONAL INC - BATON ROUGE PLANT	LA	76-14-2	Ethane, 1,2-dichloro-1,1,2,2-tetrafluoro-	Withheld	Withheld

**Table B-1: PFAS Manufacture and Import Reported in the 2016 CDR**

Parent Company	Site Name	Site State	CAS	Chemical Name	Manufacture and Import	National Aggregate PV
LANXESS CORPORATION	LANXESS CORP	PA	56773-42-3	Ethanaminium, N,N,N-triethyl-, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-1-octanesulfonate (1:1)	Withheld	< 25,000 lb
LINDE NORTH AMERICA, INC	LINDE ELECTRONICS AND SPECIALTY GASES	NJ	115-25-3	Cyclobutane, 1,1,2,2,3,3,4,4-octafluoro-	Withheld	1,000,000 - 10,000,000 lb
PEACH STATE LABS INC	PEACH STATE LABS INC COLUMBUS	GA	647-42-7	1-Octanol, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluoro-	Withheld	1,000,000 - 10,000,000 lb
PEACH STATE LABS INC	PEACH STATE LABS INC COLUMBUS	GA	68188-12-5	Alkyl iodides, C4-20, .gamma.-.omega.-perfluoro	Withheld	25,000 - 100,000 lb
Peach State Labs LLC	PEACH STATE LABS, LLC	GA	17527-29-6	2-Propenoic acid, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl ester	Withheld	1,000,000 - 10,000,000 lb
Peach State Labs LLC	PEACH STATE LABS, LLC	GA	2043-57-4	Octane, 1,1,1,2,2,3,3,4,4,5,5,6,6-tridecafluoro-8-iodo-	Withheld	1,000,000 - 10,000,000 lb
Peach State Labs LLC	PEACH STATE LABS, LLC	GA	647-42-7	1-Octanol, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluoro-	Withheld	1,000,000 - 10,000,000 lb
Peach State Labs LLC	PEACH STATE LABS, LLC	GA	68188-12-5	Alkyl iodides, C4-20, .gamma.-.omega.-perfluoro	Withheld	25,000 - 100,000 lb
SOLVAY SPECIALTY POLYMERS USA, LLC	SOLVAY SPECIALTY POLYMERS USA LLC	TX	35397-13-8	Propane, 1,1,1,2,2,3,3-heptafluoro-3-[(1,2,2-trifluoroethenyl)oxy]-, polymer with 1-chloro-1,2,2-trifluoroethene and ethene	Withheld	Withheld
SOLVAY SPECIALTY POLYMERS USA, LLC	SOLVAY SPECIALTY POLYMERS USA, LLC	GA	200013-65-6	Diphosphoric acid, polymers with ethoxylated reduced Me esters of reduced polymd. oxidized tetrafluoroethylene	Withheld	Withheld
SUMITOMO CORPORATION OF AMERICAS	SUMITOMO CORPORATION OF AMERICAS	TX	17527-29-6	2-Propenoic acid, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl ester	Withheld	1,000,000 - 10,000,000 lb



**Table B-1: PFAS Manufacture and Import Reported in the 2016 CDR**

Parent Company	Site Name	Site State	CAS	Chemical Name	Manufacture and Import	National Aggregate PV
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	1224429-82-6	Phosphoric acid, mixed esters with polyethylene glycol and 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluoro-1-octanol, ammonium salts	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	124-73-2	Ethane, 1,2-dibromo-1,1,2,2-tetrafluoro-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	17527-29-6	2-Propenoic acid, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl ester	Withheld	1,000,000 - 10,000,000 lb
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	17741-60-5	2-Propenoic acid, 3,3,4,4,5,5,6,6,7,7,8,8,9,10,10,11,11,12,12,12-heneicosafuorododecyl ester	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	19430-93-4	1-Hexene, 3,3,4,4,5,5,6,6,6-nonafluoro-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	2043-53-0	Decane, 1,1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8-heptadecafluoro-10-iodo-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	2043-54-1	Dodecane, 1,1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10-heneicosafuoro-12-iodo-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	2043-55-2	Hexane, 1,1,1,2,2,3,3,4,4-nonafluoro-6-iodo-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	2043-57-4	Octane, 1,1,1,2,2,3,3,4,4,5,5,6,6-tridecafluoro-8-iodo-	Withheld	1,000,000 - 10,000,000 lb

**Table B-1: PFAS Manufacture and Import Reported in the 2016 CDR**

Parent Company	Site Name	Site State	CAS	Chemical Name	Manufacture and Import	National Aggregate PV
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	2144-53-8	2-Propenoic acid, 2-methyl-, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl ester	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	27905-45-9	2-Propenoic acid, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluorodecyl ester	Withheld	< 25,000 lb
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	30046-31-2	Tetradecane, 1,1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12-pentacosafuoro-14-iodo-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	34362-49-7	2-Propenoic acid, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,16,16,16-nonacosafuorohexadecyl ester	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	34395-24-9	2-Propenoic acid, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,14-pentacosafuorotetradecyl ester	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	39239-77-5	1-Tetradecanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,14-pentacosafuoro-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	60699-51-6	1-Hexadecanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,16,16,16-nonacosafuoro-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	647-42-7	1-Octanol, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluoro-	Withheld	1,000,000 - 10,000,000 lb
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	65510-55-6	Hexadecane, 1,1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14-nonacosafuoro-16-iodo-	Withheld	Withheld

**Table B-1: PFAS Manufacture and Import Reported in the 2016 CDR**

Parent Company	Site Name	Site State	CAS	Chemical Name	Manufacture and Import	National Aggregate PV
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	678-39-7	1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	76-16-4	Ethane, 1,1,1,2,2,2-hexafluoro-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CHAMBERS WORKS)	NJ	865-86-1	1-Dodecanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-heneicosafuoro-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (CORPUS CHRISTI)	TX	76-14-2	Ethane, 1,2-dichloro-1,1,2,2-tetrafluoro-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (FAYETTEVILLE WORKS)	NC	2641-34-1	Propanoyl fluoride, 2,3,3,3-tetrafluoro-2-[1,1,2,3,3,3-hexafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propoxy]-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (FAYETTEVILLE WORKS)	NC	335-66-0	Octanoyl fluoride, 2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-pentadecafluoro-	Withheld	< 25,000 lb
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (FAYETTEVILLE WORKS)	NC	335-67-1	Octanoic acid, 2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-pentadecafluoro-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (HEADQUARTERS)	DE	115-25-3	Cyclobutane, 1,1,2,2,3,3,4,4-octafluoro-	Withheld	1,000,000 - 10,000,000 lb
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (HEADQUARTERS)	DE	138495-42-8	Pentane, 1,1,1,2,2,3,4,5,5,5-decafluoro-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (HEADQUARTERS)	DE	15290-77-4	Cyclopentane, 1,1,2,2,3,3,4-heptafluoro-	Withheld	Withheld

**Table B-1: PFAS Manufacture and Import Reported in the 2016 CDR**

Parent Company	Site Name	Site State	CAS	Chemical Name	Manufacture and Import	National Aggregate PV
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (HEADQUARTERS)	DE	507-63-1	Octane, 1,1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8-heptafluoro-8-iodo-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (HEADQUARTERS)	DE	62037-80-3	Propanoic acid, 2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-, ammonium salt (1:1)	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (PASCAGOULA)	MS	27619-97-2	1-Octanesulfonic acid, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluoro-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (PASCAGOULA)	MS	34455-29-3	1-Propanaminium, N-(carboxymethyl)-N,N-dimethyl-3-[[[(3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl)sulfonyl]amino]-, inner salt	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (WASHINGTON WORKS)	WV	115-25-3	Cyclobutane, 1,1,2,2,3,3,4,4-octafluoro-	Withheld	1,000,000 - 10,000,000 lb
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (WASHINGTON WORKS)	WV	354-64-3	Ethane, 1,1,1,2,2-pentafluoro-2-iodo-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (WASHINGTON WORKS)	WV	355-42-0	Hexane, 1,1,1,2,2,3,3,4,4,5,5,6,6,6-tetradecafluoro-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (WASHINGTON WORKS)	WV	355-43-1	Hexane, 1,1,1,2,2,3,3,4,4,5,5,6,6-tridecafluoro-6-iodo-	Withheld	1,000,000 - 10,000,000 lb
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (WASHINGTON WORKS)	WV	423-39-2	Butane, 1,1,1,2,2,3,3,4,4-nonafluoro-4-iodo-	Withheld	Withheld
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (WASHINGTON WORKS)	WV	423-62-1	Decane, 1,1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10-heneicosafluoro-10-iodo-	Withheld	Withheld

**Table B-1: PFAS Manufacture and Import Reported in the 2016 CDR**

Parent Company	Site Name	Site State	CAS	Chemical Name	Manufacture and Import	National Aggregate PV
The Chemours Co	THE CHEMOURS COMPANY FC, LLC (WASHINGTON WORKS)	WV	507-63-1	Octane, 1,1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8-heptafluoro-8-iodo-	Withheld	Withheld
TYCO FIRE PRODUCTS LP	CHEMGUARD INC	TX	1078715-61-3	1-Propanaminium, 3-amino-N-(carboxymethyl)-N,N-dimethyl-, N-[2-[(.gamma.-.omega.-perfluoro-C4-20-alkyl)thio]acetyl] derivs., inner salts	Withheld	25,000 - 100,000 lb
TYCO FIRE PRODUCTS LP	CHEMGUARD INC	TX	27619-89-2	1-Octanesulfonyl chloride, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluoro-	Withheld	25,000 - 100,000 lb
TYCO FIRE PRODUCTS LP	CHEMGUARD INC	TX	34455-29-3	1-Propanaminium, N-(carboxymethyl)-N,N-dimethyl-3-[[[(3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl)sulfonyl]amino]-, inner salt	Withheld	Withheld
TYCO FIRE PRODUCTS LP	CHEMGUARD INC	TX	65545-80-4	Poly(oxy-1,2-ethanediyl), .alpha.-hydro-.omega.-hydroxy-, ether with .alpha.-fluoro-.omega.-(2-hydroxyethyl)poly(difluoromethylene) (1:1)	Withheld	25,000 - 100,000 lb
TYCO FIRE PRODUCTS LP	CHEMGUARD INC	TX	68140-18-1	Thiols, C4-10, .gamma.-.omega.-perfluoro	Withheld	Withheld
TYCO FIRE PRODUCTS LP	CHEMGUARD INC	TX	68140-20-5	Thiols, C6-12, .gamma.-.omega.-perfluoro	Withheld	Withheld
TYCO FIRE PRODUCTS LP	CHEMGUARD INC	TX	68187-47-3	1-Propanesulfonic acid, 2-methyl-, 2-[[1-oxo-3-[(.gamma.-.omega.-perfluoro-C4-16-alkyl)thio]propyl]amino] derivs., sodium salts	Withheld	Withheld
TYCO FIRE PRODUCTS LP	CHEMGUARD INC	TX	70969-47-0	Thiols, C8-20, .gamma.-.omega.-perfluoro, telomers with acrylamide	Withheld	Withheld

Table B-2: Number of PFAS Manufactured by Use Reported in the 2016 CDR			
Type/Process/Use	Sector	Function	Number of PFAS
(blank)	(blank)	(blank)	33
CBI	CBI	CBI	10
Processing as a reactant	Adhesive manufacturing	Intermediates	1
Processing as a reactant	All other basic organic chemical manufacturing	Intermediates	16
Processing as a reactant	All other basic organic chemical manufacturing	Processing aids, not otherwise listed	2
Processing as a reactant	Computer and electronic product manufacturing	Intermediates	1
Processing as a reactant	Industrial gas manufacturing	Intermediates	1
Processing as a reactant	Miscellaneous manufacturing	Intermediates	1
Processing as a reactant	Not known or reasonably ascertainable	Not known or reasonably ascertainable	1
Processing as a reactant	Paint and coating manufacturing	Intermediates	1
Processing as a reactant	Plastic material and resin manufacturing	Intermediates	13
Processing as a reactant	Textiles, apparel, and leather manufacturing	Intermediates	4
Processing—incorporation into article	Paint and coating manufacturing	Plating agents and surface treating agents	1
Processing—incorporation into article	Paper manufacturing	Finishing agents	1
Processing—incorporation into article	Textiles, apparel, and leather manufacturing	Finishing agents	1
Processing—incorporation into formulation, mixture, or reaction product	Adhesive manufacturing	Surface active agents	1
Processing—incorporation into formulation, mixture, or reaction product	All other basic inorganic chemical manufacturing	Surface active agents	1
Processing—incorporation into formulation, mixture, or reaction product	All other basic organic chemical manufacturing	Processing aids, not otherwise listed	1
Processing—incorporation into formulation, mixture, or reaction product	All other chemical product and preparation manufacturing	Firefighting foam agents	8
Processing—incorporation into formulation, mixture, or reaction product	All other chemical product and preparation manufacturing	Solvents (for cleaning and degreasing)	6
Processing—incorporation into formulation, mixture, or reaction product	All other chemical product and preparation manufacturing	Surface active agents	2
Processing—incorporation into formulation, mixture, or reaction product	CBI	CBI	2
Processing—incorporation into formulation, mixture, or reaction product	CBI	Surface active agents	1
Processing—incorporation into formulation, mixture, or reaction product	Computer and electronic product manufacturing	Functional fluids (closed systems)	1

Table B-2: Number of PFAS Manufactured by Use Reported in the 2016 CDR			
Type/Process/Use	Sector	Function	Number of PFAS
Processing—incorporation into formulation, mixture, or reaction product	Computer and electronic product manufacturing	Solvents (which become part of product formulation or mixture)	1
Processing—incorporation into formulation, mixture, or reaction product	Computer and electronic product manufacturing	Surface active agents	1
Processing—incorporation into formulation, mixture, or reaction product	Miscellaneous manufacturing	Plating agents and surface treating agents	2
Processing—incorporation into formulation, mixture, or reaction product	Oil and gas drilling, extraction, and support activities	Surface active agents	1
Processing—incorporation into formulation, mixture, or reaction product	Paint and coating manufacturing	Paint additives and coating additives not described by other categories	1
Processing—incorporation into formulation, mixture, or reaction product	Paint and coating manufacturing	Surface active agents	1
Processing—incorporation into formulation, mixture, or reaction product	Pesticide, fertilizer, and other agricultural chemical manufacturing	Surface active agents	2
Processing—incorporation into formulation, mixture, or reaction product	Plastic material and resin manufacturing	Processing aids, specific to petroleum production	1
Processing—incorporation into formulation, mixture, or reaction product	Plastic material and resin manufacturing	Solvents (which become part of product formulation or mixture)	1
Processing—incorporation into formulation, mixture, or reaction product	Printing ink manufacturing	Processing aids, not otherwise listed	1
Processing—incorporation into formulation, mixture, or reaction product	resale of chemicals	Plating agents and surface treating agents	1
Processing—incorporation into formulation, mixture, or reaction product	Soap, cleaning compound, and toilet preparation manufacturing	Surface active agents	3
Processing—incorporation into formulation, mixture, or reaction product	Wholesale and retail trade	CBI	1
Processing—repackaging	All other chemical product and preparation manufacturing	Plating agents and surface treating agents	1
Processing—repackaging	All other chemical product and preparation manufacturing	Solvents (for cleaning and degreasing)	1
Processing—repackaging	Industrial gas manufacturing	transfilling and purifying	1
Processing—repackaging	Miscellaneous manufacturing	Solvents (for cleaning and degreasing)	1
Processing—repackaging	Paint and coating manufacturing	Paint additives and coating additives not described by other categories	1
Processing—repackaging	Plastic material and resin manufacturing	Intermediates	1

Table B-2: Number of PFAS Manufactured by Use Reported in the 2016 CDR			
Type/Process/Use	Sector	Function	Number of PFAS
Processing—repackaging	Plastic material and resin manufacturing	Solvents (which become part of product formulation or mixture)	1
Use—non-incorporative activities	All other chemical product and preparation manufacturing	Fire Extinguishing Medium	1
Use—non-incorporative activities	All other chemical product and preparation manufacturing	Functional fluids (open systems)	1
Use—non-incorporative activities	CBI	CBI	2
Use—non-incorporative activities	CBI	Functional fluids (closed systems)	2
Use—non-incorporative activities	Computer and electronic product manufacturing	CBI	1
Use—non-incorporative activities	Computer and electronic product manufacturing	Functional fluids (closed systems)	9
Use—non-incorporative activities	Computer and electronic product manufacturing	Functional fluids (open systems)	1
Use—non-incorporative activities	Computer and electronic product manufacturing	Plating agents and surface treating agents	1
Use—non-incorporative activities	Computer and electronic product manufacturing	Solvents (for cleaning and degreasing)	7
Use—non-incorporative activities	Fabricated metal product manufacturing	Solvents (for cleaning and degreasing)	2
Use—non-incorporative activities	Miscellaneous manufacturing	Solvents (for cleaning and degreasing)	1
Use—non-incorporative activities	Not known or reasonably ascertainable	Lubricants and lubricant additives	1
Use—non-incorporative activities	Plastic material and resin manufacturing	Processing aids, not otherwise listed	2
Use—non-incorporative activities	Primary metal manufacturing	Functional fluids (open systems)	1
Use—non-incorporative activities	Stored on site in rail cars, no commercial use	Stored on site in rail cars, no commercial use	1



## Appendix C: References

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